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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,524	08/22/2003	Paolo Priotti	004770.00511	8918

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EXAMINER	
TORRES, JUAN A	
ART UNIT	PAPER NUMBER
2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/646,524	PRIOTTI, PAOLO	
	Examiner	Art Unit	
	Juan A. Torres	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 August 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *02-19-2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "the step of recomposing the received signal using an inverse fast Fourier transform (IFFT) subsequent to FFT filtering" (claim 9); and the "an IFFT function for recomposing the transformed signal subsequent to developing the weighted representation" (claim 16) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated (for figure 1, see page 3 to page 7 of the specification; for figure 2 see Mody (US 20020181509 A1) figure 1). See MPEP § 608.02(g).

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "280" (in figure 2, see specification page 11); "300" (in figure 3, see specification pages 9 and 11); "385_1" (in figure 3, see specification page 13).

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "385" (in figure 3).

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate

prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities:

a) In page 5 at the end of the second paragraph the recitation "bandwith" is improper; it is suggested to be changed to "bandwidth".

b) In page 6 line 3 the recitation "potions" is improper; it is suggested to be changed to "portions" (see page 6 lines 4 and 5).

c) In page 11 last line the recitation "transmit antenna 3201 and receiver antenna 3401" is improper; it is suggested to be changed to "transmit antenna 320_1 and receiver antenna 340_1" (see figure 3).

d) In page 12 line 21 line the recitation "ther is" is improper; it is suggested to be changed to "there is".

e) In page 16 line 22 the recitation "byfirst" is improper; it is suggested to be changed to "by first".

f) In page 17 line 8 the recitation "Active subcarriers are one every ? subcarriers" is not understood.

g) In page 17 line 10 the recitation "410" is improper; it is suggested to be changed to "420" (see figure 4).

Appropriate correction is required.

Claim Objections

Claims 15 and 16 are objected to because of the following informalities: the recitation in line 1 of claims 15 and 16 "wherein the a frequency" is improperly constructer because of the use of an indeterminate preposition after a determinate preposition; it is suggested to be changed to "wherein the frequency".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-8, 10-15 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mody (US 20020181509 A1) in view of Walton (US 20030235147 A1) (hereafter Mody1 and Walton).

As per claim 1, Mody1 discloses receiving an OFDM transmission (figures 1 and 7 block 20; paragraphs [0071]-[0072]); performing frequency synchronization of the received signal (figure 7 and 8 block 61; paragraphs [0072]-[0079]). Mody1 doesn't disclose developing a weighted representation of the received signal. Walton discloses developing a weighted representation of the received signal (paragraph [0149]). Mody1 and Walton are analogous art because they are from the same field of endeavor of OFDM systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the decoding system disclosed by Mody1 the weighting algorithm disclosed by Walton. The suggestion/motivation for doing so would have been to achieve maximal-ratio combining given more weight to the signals with higher SNR (Walton paragraph [0149]).

As per claim 2, Mody1 and Walton disclose claim 1, Mody1 also discloses performing a course-time synchronization of the received signal prior to weighted representation (figure 8 block 66 paragraph [0075]).

As per claim 3, Mody1 and Walton disclose claim 2, Mody1 also discloses that the OFDM transmission is a packetized data transmission and where the course-time synchronization comprises packet detection (figure 4 paragraphs [0052]-[0059] and figure 8 block 66 paragraph [0075]; and figures 9A and 9B paragraphs [0082]-[0088]; see also Walton paragraph [0052]).

As per claim 4, Mody1 and Walton disclose claim 2, Mody1 also discloses performing a fine-time synchronization of the received signal prior to weighted

representation (figure 8 block 72 paragraph [0075] and figure 11 paragraphs [0094]-[0099]).

As per claim 5, Mody1 and Walton disclose claim 2, Mody1 also discloses performing a fine-time synchronization of the received signal subsequent to the step of performing frequency synchronization (figure 8 block 72 paragraph [0075] and figure 11 paragraphs [0094]-[0099]).

As per claim 6, Mody1 and Walton disclose claim 1, Mody1 also discloses a multiple-input multiple output (MIMO) OFDM system, and that the frequency synchronization of the received signal is performed for the signal received through at least one receive antenna (abstract; figure 7 block 20 paragraph [0072]).

As per claim 7, Mody1 and Walton disclose claim 6, Mody1 also discloses that the frequency synchronization of the received signal is performed for the signals received through all of the receive antennas (abstract; figures 1 and 7 block 20 paragraph [0072]).

As per claim 8, Mody1 and Walton disclose claim 1, Mody1 also discloses that the training symbols have been modulated in an OFDM modulator of the transmitter (figures 1-4 paragraphs [0007]-[001]; [0038]-[0047]; and [0052][-0053]), and where the performing frequency synchronization further comprises the step of performing fast Fourier transform (FFT) filtering (figures 7 and 11 block 64 paragraphs [0076] and [0094]).

As per claim 10, Mody1 discloses at least one antenna for receiving the OFDM transmission signal (figures 1 and 7 block 20; paragraphs [0071]-[0072]); a frequency

synchronization module couple to the at least one antenna (figure 7 and 8 block 61; paragraphs [0072]-[0079]); and a frequency offset compensation module for performing frequency offset compensation on the received signal using the representation developed by the frequency synchronization module (figure 8 block 74; paragraphs [0075]-[0079]). Mody1 doesn't disclose developing a weighted representation of the received signal. Walton discloses developing a weighted representation of the received signal (paragraph [0149]). Mody1 and Walton are analogous art because they are from the same field of endeavor of OFDM systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the decoding system disclosed by Mody1 the weighting algorithm disclosed by Walton. The suggestion/motivation for doing so would have been to achieve maximal-ratio combining given more weight to the signals with higher SNR (Walton paragraph [0149]).

As per claim 11, Mody1 and Walton disclose claim 10, Mody1 also discloses that the at least one antenna comprises a plurality of antennas (figure 1 block 20 paragraph [0031]), and a plurality of frequency synchronization modules, each frequency synchronization module coupled to one of the plurality of antennas (figure 7 and 8 block 61; paragraphs [0072]-[0079]).

As per claim 12, Mody1 and Walton disclose claim 10, Mody1 also discloses that the OFDM transmission includes data in packet form a packet detector coupled to the at least one antenna and to the frequency synchronization module (figure 4 paragraphs [0052]-[0059] and figure 8 block 66 paragraph [0075]; and figures 9A and 9B paragraphs [0082]-[0088]; see also Walton paragraph [0052]).

As per claim 13, Mody1 and Walton disclose claim 10, Mody1 also discloses a fine-time synchronization module for performing fine-time synchronization on the received signal prior to the developing of a weighted representation of the received signal (figure 8 block 72 paragraph [0075] and figure 11 paragraphs [0094]-[0099]).

As per claim 14, Mody1 and Walton disclose claim 10, Mody1 also discloses a fine-time synchronization module coupled to the frequency synchronization module for performing fine-time synchronization on the frequency synchronized module (figure 8 block 72 paragraph [0075] and figure 11 paragraphs [0094]-[0099]).

As per claim 15, Mody1 and Walton disclose claim 10, Mody1 also discloses a frequency synchronization module couple further comprises an FFT filter for applying an FFT to the received signal prior to developing the weighted representation (figures 7 and 11 block 64 paragraphs [0076] and [0094]).

As per claim 17, Mody1 and Walton disclose claim 10, Mody1 also discloses a terminal operable in a cellular telephone network (paragraph [0027]).

As per claim 18, Mody1 and Walton disclose claim 10, Mody1 also discloses a terminal operable in a wireless local area network (WLAN) (paragraph [0027]).

Claims 9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mody1 and Walton as applied to claims 8 and 10 above, and further in view of Mody (US 20020181390 A1) (hereafter Mody2).

As per claim 9, Mody1 and Walton disclose claim 8. Mody1 and Walton don't disclose recomposing the received signal using an inverse fast Fourier transform (IFFT) subsequent to FFT filtering. Mody2 discloses recomposing the received signal using an

inverse fast Fourier transform (IFFT) subsequent to FFT filtering (figure 9 paragraphs [0083]-[0087]). Mody2, Mody1 and Walton are analogous art because they are from the same field of endeavor of OFDM systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the decoding system disclosed by Mody1 and Walton the channels estimation using IFFT disclosed by Mody2. The suggestion/motivation for doing so would have been to reduce the mean square error (MSE) in the channel estimation (Mody2 paragraph [0086]).

As per claim 16, Mody1 and Walton disclose claim 15. Mody1 and Walton don't disclose an IFFT function for recomposing the transformed signal subsequent to developing the weighted representation. Mody2 discloses an IFFT function for recomposing the transformed signal subsequent to developing the weighted representation (figure 9 paragraphs [0083]-[0087]). Mody2, Mody1 and Walton are analogous art because they are from the same field of endeavor of OFDM systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the decoding system disclosed by Mody1 and Walton the channels estimation using IFFT disclosed by Mody2. The suggestion/motivation for doing so would have been to reduce the mean square error (MSE) in the channel estimation (Mody2 paragraph [0086]).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Mody (US 20040131012 A1) discloses systems and methods for detecting, correcting, and controlling the sampling frequency offset in a Multi-Input,

Multi-Output (MIMO) OFDM system using carrier weighting. Kumagai (US 7058002 B1) discloses an OFDM receiver for demodulating OFDM signals accurately with little process delay and high transmission efficiency, even when there is a sampling clock frequency error and/or a carrier frequency error between a transmitter and a receiver, and/or received signals are affected by phase noise and/or thermal noise. Yugang Ma ("Modified nonlinear least square approaches to carrier frequency offset estimation in OFDM systems", Communications Letters, IEEE Volume 7, Issue 4, April 2003 Page(s): 177–179) discloses two modified nonlinear least square (NLS) estimators for carrier frequency offset (CFO) in orthogonal frequency-division multiplexing (OFDM) systems in the modified NLS CFO estimators, slot elements in an OFDM block symbol are weighted in terms of their received energies. Pei-Yun Tsai ("Joint weighted least-squares estimation of carrier-frequency offset and timing offset for OFDM systems over multipath fading channels" IEEE Transactions on Vehicular Technology, Volume 54, Issue 1, Jan. 2005 Page(s): 211-223) discloses an algorithm for joint estimation of carrier-frequency offset and timing offset for orthogonal frequency-division multiplexing (OFDM) systems in the tracking mode proposing a weighted least-squares algorithm that derives its estimates based on phase differences in the received pilot subcarrier signals between two symbols, the optimal weights in two different channel conditions are derived; analysis and simulation show that the weighted least-squares algorithm can effectively and accurately estimate the carrier-frequency offset as well as the timing offset of OFDM signals in multipath fading channels. Honan ("Performance analysis of diversity combining method for OFDM blind carrier synchronization", The 57th IEEE

Semiannual Vehicular Technology Conference, 2003. VTC 2003-Spring. Volume 4, 22-25 April 2003 Page(s): 2672-2676 vol.4) discloses a diversity branch weighted nonlinear least squares (NLS) estimator for carrier offset estimation including maximal ratio combining (MRC) by simply weighting each receive branch proportional to it's respective signal to noise ratio (SNR).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Juan Alberto Torres
08-08-2006